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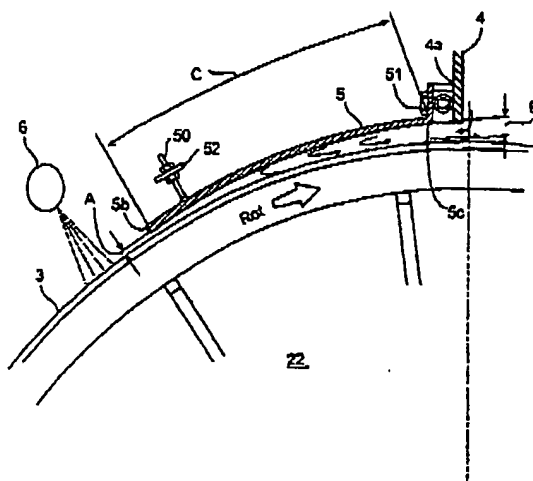
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[SE/SE]; Maja Råds väg 4, S-653 46 Karlstad (SE).For two-letter codes and other abbreviations, refer to the "Guid-  
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(54) Title: SEALING ARRANGEMENT FOR A PULP DEWATERING ARRANGEMENT



(57) Abstract: Arrangement for washing and dewatering of a fibre pulp suspension, which arrangement comprises two hollow, circular-cylindrical screen members (1), which screen members comprise evacuation chambers arranged inside the said screen members for leading off liquid. The screen members rotate counter to each other to form a nip (2), at least one of the said screen members (1) being arranged in a trough (7, 8) which partially encloses the jacket (3) of the screen member and which, in the direction of rotation of the screen member, converges towards the jacket of the screen member. The invention concerns a sealing arrangement 5 for a pulp headbox which distributes the pulp onto the jacket surface of the screen members. By forming a progressively decreasing gap B-A at the pulp headbox (4) counter to the rotation of the screen member, a simple self-sealing of the pulp suspension can be obtained which allows fibre residues to be returned to the dewatering zone. No wear between screen members and seal occurs with the invention.

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## SEALING ARRANGEMENT FOR A PULP DEWATERING ARRANGEMENT

The present invention relates to a sealing arrangement according to the preamble of Claim 1.

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### PRIOR ART

In production of paper pulp from cellulose-containing fibre material, it is necessary to wash and dewater the paper pulp at several stages in the process. A previously known and commonly used arrangement for washing and dewatering of paper pulp, called a wash press, is described in SE-C-380,300, SE-C-501,710, US 5,488,900 and SE-C-504,011. The arrangements disclosed in these documents comprise two cylindrical rotatable screen members arranged in an essentially convergent trough. Other examples of known arrangements are disclosed in US 4,543,161 and in US 5,667,642, the last-mentioned representing an arrangement in which the screen members rotate in the opposite direction to the usual one, i.e. the right screen member rotates counter-clockwise and the left screen member rotates clockwise, as viewed from the side.

A problem encountered in washing and dewatering with wash presses of the abovementioned type is that fibre residues can remain on the drum after the washed and dewatered fibre mat has been removed. To flush these fibre residues away and to clean the holes in the screen members, spray pipes are used, for example those shown in US 4,861,433, where the spray pipes flush the exposed surface of the cylindrical rotatable screen members after the washed and dewatered fibre mat has been scraped off by a doctor blade. In wash presses with 180 degree coverage of the pulp web, the flushing takes place on the downwardly moving part of the drum, which means that the spray water and flushed-off fibre residues can run off. This has functioned satisfactorily, and repeated shutdowns for cleaning are

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not required. These spray pipes have shortcomings in their flushing capacity in high-power wash presses with longer dewatering paths of 270 degrees coverage, where pulp for dewatering is applied at the highest point of the drum and dewatered pulp is removed at the press nip between two drums. In such constructions, the spray water and the flushed-off fibre residues cannot run off along the drum naturally, since this flow would run back down towards the dewatered pulp. This means that fibre residues are continuously accumulated on the surface of the screen members against the pulp headbox until the wash press is buried.

This accumulation of fibre residues means that the wash press has to be cleaned at regular intervals. Examples of sealing arrangements on the pulp headbox are shown in US 3,980,518 and SE-B-504,011. SE-B-503,010 shows a variant with resilient steel bands whose purpose is to allow pressurization of the pulp area and compatibility with wire cloths. Adjustment of the seal is said to be simple, as is its replacement when so required. The wear and tear on this type of seal is extensive and it needs to be replaced at more or less regular intervals.

## BRIEF DESCRIPTION OF THE INVENTION

One object of the present invention is to avoid the problems with known sealing arrangements in the headboxes of wash presses and to make available a wash press with improved sealing of the pulp headbox, which sealing can be easily adjusted depending on the pulp concentration in question and the pressure of the pulp in the pulp headbox.

Another object is to make available a wash press with improved sealing of the pulp headbox, which sealing allows fibre residues remaining on the surface of the circular screen members to pass the seal and onwards into the dewatering zone. This prevents fibre residues

- 3 -

from accumulating against the sealing strip and instead being drawn into the dewatering or press area again. No pile of accumulating fibre residues builds up against the seal, which fibre residues otherwise lead to increased wear of the screen plate. The wash press can therefore be operated for longer periods of time without unnecessary stops for cleaning, and it is possible to dispense with complicated cleaning arrangements.

10

Yet another object is to make available a wash press with improved sealing of the pulp headbox, which seal itself is exposed to minimum continuous wear, and the wear on cooperating screen members is reduced to a minimum.

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Yet another object is that the primary seal is achieved by the fact that a dynamically sealing plug with progressively increasing concentration of pulp is formed in the sealing gap. The dynamically sealing plug is also able to adapt continuously to changes in the sealing gap caused by the gap-forming plate changing position or the screen member springing aside. The dynamic effect is achieved by the fact that outflowing pulp along the lip is continuously thickened, turns and follows the screen plate back into the press again. The dynamic effect ensures that the loads and the wear which would otherwise be developed by a stationary fibre plug against the screen plate can be greatly reduced.

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#### BRIEF DESCRIPTION OF THE FIGURES

The invention will be described below with reference to the figures, in which:

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Fig. 1 shows a sealing arrangement according to the invention implemented in a wash press, seen in cross-section,

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Fig. 2 shows the sealing arrangement according to the invention on a larger scale,

- 5 Fig. 3 shows a detail of a variant of the sealing arrangement according to the invention.

#### DETAILED DESCRIPTION OF THE FIGURES

- 10 The type of wash press in which the sealing arrangement according to the invention is used is shown in Fig. 1 and comprises two hollow, circular-cylindrical screen members 1 which comprise a number of evacuation chambers under the jacket surface of the screen member  
15 for leading off evacuated liquid. The two screen members form a press nip 2 between each other and are arranged to rotate counter to each other, where, as viewed from the side, the right screen member rotates clockwise and the left screen member rotates  
20 counterclockwise. Since the arrangement is essentially symmetrical in a plane of symmetry which is formed by a tangent to the screen member 1 in the nip 2, only one symmetrical part will continue to be described hereinafter.

- 25 The screen member 1 preferably has a diameter of 1.0 to 2.5 metres. Its jacket 3 is further perforated to allow liquid to be evacuated from a fibre pulp web lying on the jacket surface and onwards into individual  
30 evacuation chambers 22 which carry evacuated liquid off axially into the screen member. The evacuation chambers 22 communicate with each other by means of the fact that channels running in the circumferential direction are formed between supports (not shown) arranged  
35 directly under the screen plate bearing against the axially directed evacuation chambers.

In the preferred embodiment shown in Fig. 1, a pulp headbox 4 is arranged on each screen member 1. Each

- 5 -

pulp headbox 4 is arranged at 0° on the screen member, where 0° constitutes the highest/uppermost point of the screen member and degrees increase positively in the direction of rotation of the screen member. Incoming paper pulp, which normally has a concentration of about 1 - 12%, preferably 3 - 10%, is distributed by means of the headbox uniformly along the length of the screen member.

10 In the preferred embodiment shown in Fig. 1, there is also a trough which, for each screen member 1, consists of at least two trough sections 7, 8 which can be pivoted via shafts 9 by means of a hydraulic cylinder 12.

15 The screen members 1 are arranged to rotate at a speed of 5 - 20 rpm by means of a suitable drive mechanism. Paper pulp follows the rotation of the screen members into the gap 19 between the perforated jacket surface 3 and the walls of the trough 7, 8, where it forms a fibre pulp web which is dewatered by virtue of the fact that the gap converges in the direction towards the nip. The liquid which is pressed out of the fibre pulp web is led off (not shown) from the arrangement. In the wash zones 18, where the gap can be slightly diverging, washing liquid is introduced into the fibre pulp web, and the latter is washed. Finally, the fibre pulp web is dewatered by the pressure in the nip 2 to a concentration which is about 5 - 20 times higher than the concentration of the incoming paper pulp, for example 1 - 12% on entry and 25 - 40% after the nip. The fibre pulp web is torn off from the jacket 3 and is led off from the arrangement with the aid of the stripper and the conveyor screw 20.

35 During operation, a paper pulp having a concentration of about 1 - 12% is led into the gap 19 via the pulp headbox 4. The invention is now described in more detail with reference to Figure 2 which shows the main

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- features of the invention. The pulp headbox 4 distributes the pulp over the whole width of the wash press in a manner known per se using a distributor screw corresponding to that shown in US 4,559,104.
- 5 Arranged at the rear edge of the headbox 4 directed counter to the direction of rotation of the screen member there is, according to the invention, a seal-forming plate shroud 5 which on its outer edge 5b is arranged at a distance A from the surface of the screen
- 10 member. The inner edge 5c is secured to the pulp headbox 4 by any suitable fastening means, for example a sealing bolt connection 51, welding or in another way.
- 15 The plate shroud 5 has a circumferential extent over the screen member exceeding the primary dimension B between the surface of the screen member and the inside of the plate shroud at its inner edge 5c. The free length C of the plate shroud should lie in the range of
- 20 at least 2 - 20 times the length of the primary dimension B, preferably 10 times this. In application with pulp concentrations of around 10% and a primary dimension of about 30 mm, a very good sealing function is obtained for a free length C of the plate shroud of
- 25 about 300 millimetres.

- To be able to easily adapt the sealing function of the plate to the pulp pressure and pulp concentration, where increasing pulp pressure and falling pulp
- 30 concentration require a smaller distance A, an adjusting member 50 is preferably provided acting on the outer edge of the plate shroud. This adjusting member 50 can consist, for example, as shown in the figure, of a single clamping screw which is arranged on
- 35 a bracket 52 secured in the stand of the wash press.

The sealing function of the sealing arrangement 5 is obtained by means of a controlled leakage flow being formed under the plate 5 as a function of the size of



- 7 -

the gap B. As the flow of the pulp suspension into the gap is counter to the rotation of the screen member, a continuous dewatering against the jacket surface of the screen member is obtained. By means of this continuous dewatering, the pulp suspension under the plate shroud 5 forms a self-sealing plug which prevents further leakage past the outer edge 5b.

If, despite everything, a leakage is observed, this is countered by decreasing the gap A with the adjusting member 50.

In a conventional manner there can also be sprays 6 for flushing away fibres which may have accumulated on the screen arrangement.

The arrangement according to the invention is not limited to the embodiments described above, and instead can be varied within the scope of the attached patent claims. For example, the outer edge 5b of the plate shroud can be provided with a small sealing rubber strip, see Figure 3, which can be useful when using the wash press with very low pulp concentrations. Such a sealing arrangement can also be formed in such a way that it can be pivoted aside after a start-up procedure where the sealing strip is only initially required to build up the sealing pulp plug. Such a pivotable strip can simply be arranged on a hinge-like structure (not shown).

The adjusting arrangement 50 can also be replaced by a servo mechanism which automatically adjusts to the plug formed. Automatic adjustment of this type can also be provided, for example, by re-coupling the necessary setting force, where a setting force above a certain level indicates that the sealing plug has been able to form.

## PATENT CLAIMS

1. Arrangement for washing and dewatering of a fibre  
5 pulp suspension, which arrangement comprises two  
circular-cylindrical screen members (1) arranged to  
rotate counter to each other to form a nip (2), at  
least one of the said screen members being hollow to  
10 permit evacuation of liquid radially inwards into the  
screen member, at least the hollow screen member (1)  
being arranged in a trough (7, 8) which partially  
encloses the jacket (3) of the screen member and which,  
in the direction of rotation of the screen member,  
15 converges towards the jacket of the screen member, and  
in which at least one pulp headbox (4) is arranged on  
the trough-provided screen member (1) for introducing  
pulp between the jacket (3) of the screen member and  
its trough (7, 8) in order to form a fibre pulp web on  
the screen member,  
20 c h a r a c t e r i z e d i n that the pulp headbox  
comprises a sealing arrangement (5) arranged between  
the pulp headbox and the screen member, this seal  
comprising a sealing surface with a progressively  
decreasing gap between the pulp headbox and the screen  
25 member in the direction counter to the rotation of the  
screen member, the gap at an inner edge (5c) of the  
pulp headbox corresponding to a first dimension B, and  
the gap at the outer edge (5b) of the pulp headbox  
corresponding to a second dimension A, and in that the  
30 gap has a circumferential extent over the screen member  
exceeding the dimension B by at least 2 times.

2. Arrangement according to Claim 1,  
c h a r a c t e r i z e d i n that the sealing  
35 arrangement is made of a thin-walled element which has  
a circumferential extent in the range of 2 to 20 times  
the dimension B.

3. Arrangement according to Claim 1 or 2,

- 10 -

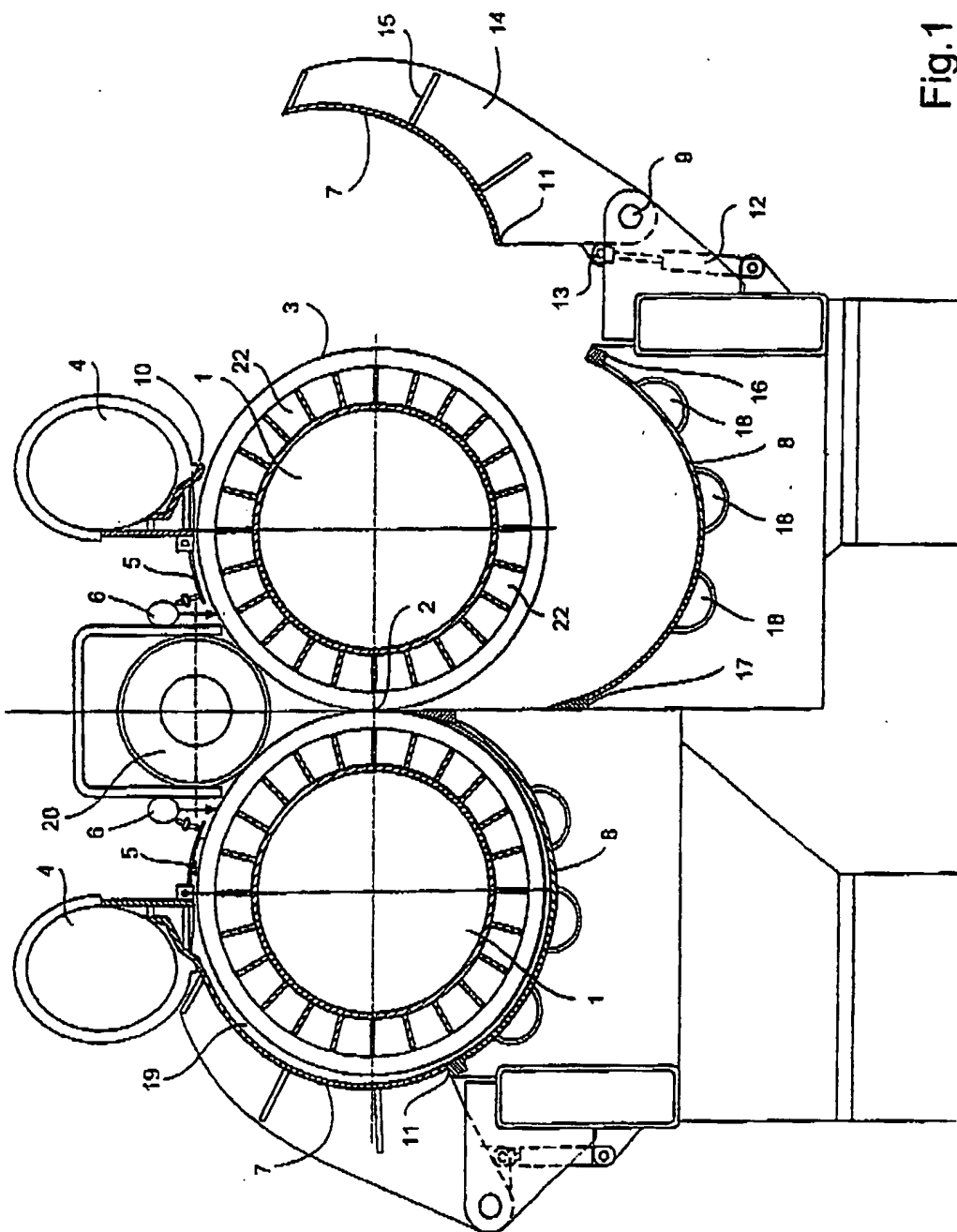
characterized in that the dimension A corresponds to 10 - 90% of the dimension B, preferably less than 50% of the dimension B.

- 5 4. Arrangement according to any of the preceding claims,  
characterized in that the dimension A corresponds to a gap of the order of magnitude of 5 -  
10 millimetres for feeding pulp concentrations in the  
10 region of 10 - 12%.

5. Arrangement according to any of the preceding claims,  
characterized in that the sealing  
15 arrangement is made of a thin-walled element in which the gap distance A is adjustable by means of an adjusting arrangement 50 for adapting the gap to the prevailing pulp concentrations and pressure of the pulp in the headbox.

- 20 6. Arrangement according to any of the preceding claims,  
characterized in that the outer edge 5b of the sealing arrangement 5 is provided with an  
25 elastic sealing strip which is securely mounted on the outer edge 5b and bridges the gap A in such a way that the free end of the sealing strip bears against the surface of the screen member.

1/2



**2/2**

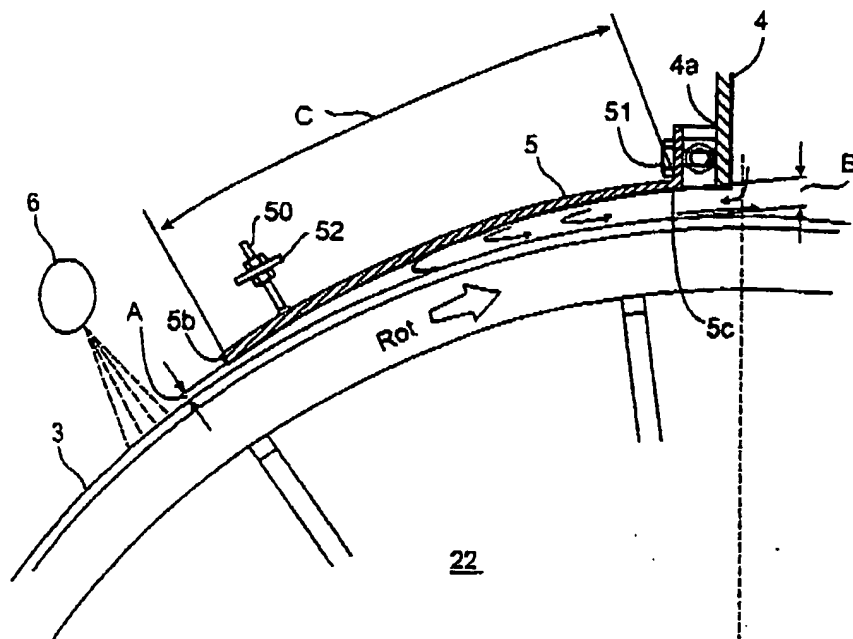


Fig.2

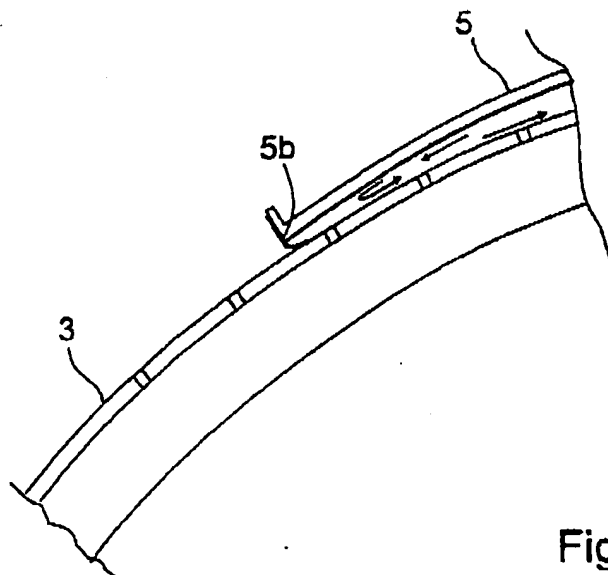


Fig.3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01172

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21C 9/06, D21C 9/18, B30B 9/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21C, D21F, D21D, B30B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3772144 A (OSCAR LUTHI ET AL), 13 November 1973 (13.11.73), column 4, line 32 - line 45, figure 2	1-6
A	US 3980518 A (BERNT JOHAN LJUNG ET AL), 14 Sept 1976 (14.09.76), column 3, line 43 - line 48, figure 3	1-6
A	WO 9510658 A1 (SUNDS DEFIBRATOR INDUSTRIES AB), 20 April 1995 (20.04.95), figure 2	1-6
A	SE 509519 C2 (SUNDS DEFIBRATOR INDUSTRIES AB), 8 February 1999 (08.02.99), figure 2	1-6

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**  
 Information on patent family members

03/10/00

International application No.

PCT/SE 00/01172

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